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No. VI.

MACHINE FOR TINNING SHEET-COPPER.

The SILVER MEDAL and TEN GUINEAS were presented to Mr. THOMAS WEEKS, No. 2 Bull's Fields, Woolwich, for his Machine for Tinning Sheet-Copper; a Model of which has been placed in the Society's Repository.

SIR,

HAVING invented a method of tinning sheet-copper, more simple, more economical, and less injurious to health than any hitherto in use, I take the liberty of submitting it to the Society for the Encouragement of Arts, &c., in order to obtain for it such an expression of approbation as it may seem to deserve; and thus to make known to others a process which has already been productive of great practical benefit in the department in which I am employed.

As the advantage of my method consists partly in doing away with certain objectionable and injurious portions of the old process, I am under the necessity of briefly stating the several stages of the latter, together with these objections, in order that the superiority of the former may thus be rendered more apparent.

1st. Under the old method the copper-sheet, previously cleaned with sulphuric acid, sand, and water, was sprinkled over with powdered sal ammoniac on both sides, and then held by the workman over a charcoal fire until

all the moisture was evaporated and the fused sal ammoniac became evenly spread out over its surface. By this first stage of the process the men were not only constantly exposed to the fumes of sal ammoniac (which have proved seriously injurious to the health of some of them), but also to the almost equally noxious carbonic acid gas and heat evolved from a large charcoal fire.

2d. The sheet of copper thus covered with sal ammoniac was immersed in melted tin, and on being withdrawn, its upper surface was rubbed over with a hank of tow held in the hand of the workman.

3d. The tin adhering to the under side having cooled during the wiping of the upper surface of the sheet, it was necessary again to heat it over a charcoal fire to the melting point of tin, and to add sal ammoniac to such portions as had not taken the tin in the first part of the process,—this surface was then wiped off with tow in the same manner as the other.

4th. However carefully this third part of the process was performed, some drops of tin, wiped from the last finished surface, would run over the edge of the sheet and collect in drops and small streams on the surface which was previously wiped, whence it became necessary again to melt the metal covering this surface, and to wipe it off with tow as before.

These 2d, 3d, and 4th processes occupied much time, the sheet requiring to be twice heated to the melting point of tin after it had been withdrawn from the vessel in which the tin was first applied to its surface. 2dly. They were injurious to health, from the men being required to pass much time over large charcoal fires, with the addition occasionally of the fumes of sal ammoniac. 3dly. They were expensive, from the consumption of men's time, of

charcoal, and also from the unavoidable waste of tin, of which no less than thirty-six ounces were lost in the fires and floors of the shop for every 100 feet of copper tinned. And lastly, They were imperfect, inasmuch as the quantity of tin left on the copper depends on the tact of the workman, and is also less on that surface which is twice melted and twice rubbed with tow.

Having in this general manner described the process usually employed in tinning sheet-copper, and pointed out these objections to it, of which I have had ample and personal experience, I now proceed to the detail of the new method by which these objections may be obviated ; and in doing so, I shall, for the sake of greater perspicuity, divide the process into two operations, the first comprising the preparation of the copper, and the second, the tinning of it, each of which I shall describe as it is practised in the Royal Arsenal at Woolwich, for tinning sheets of copper used for lining ships' powder-cases, which are five feet long by two feet broad.

1st. *The Preparation of the Copper.*—After being cleaned with sulphuric acid, sand, and water, as in the old process, the copper-sheets are washed in a cistern of pure water, and then hung up to dry; when dry they are laid on a broad bench which is placed near the tinning machine, and furnished at one end with a brown glazed dish or glass vessel containing undiluted muriatic acid. At this bench the sheets undergo the new process of preparation, which consists solely in lightly brushing over the surface with the muriatic acid by means of a small hempen brush or hank of tow.

2d. *The Tinning Process.*—Having in this way prepared the sheet for the reception of the tin, that portion of the machine containing the upper brushes and scraper

is raised by pulling the cord n passing over the pulley m , and one half of the length of the sheet is plunged into the melted tin, and pressed beneath its surface by means of a "holder down" (a piece of half-inch board with a handhold) held by a man standing at the side of the machine. By relaxing the cord, the upper is then allowed to fall on the lower set of brushes, and by means of strong pliers the sheet is drawn out from the pit of melted metal, and made to pass between the two sets of brushes by a man standing at the end of the machine. In this way one half of the length of the sheet is perfectly tinned on both sides, and by the following process the other half is finished in the same way. Just as the sheet escapes from the machine a man, standing ready for that purpose, seizes it within three or four inches of the end with a pair of pliers held in his right hand, while his left, guarded by a stout leathern glove, is extended towards the other end of the sheet so as to enable him to turn the untinned end towards the machine, which has been already opened for its reception, by the man standing at its side. This end is then immersed in the melted tin till about two inches of the already tinned surface is covered by it, it is then withdrawn through the machine as before, the man who pulls it out being careful to use clean pliers for the purpose, because those previously used being wet with the muriatic acid would leave a mark on the tinned surface of the sheet. In this way both surfaces are uniformly covered with tin without any appearance of joint in the middle or selvage at the edge of the sheet, while all the imperfect, expensive, injurious, and tedious processes of the old method are entirely done away with.

When only one side of a sheet of copper is to be tinned, a roller and bearer is substituted for the lower

scraper, and the surface of the sheet which is required not to take the tin is brushed over with plumber's size.

The following Tables may serve further to illustrate the comparative merits of the two processes:—

TABLE I.—*Results of the Old Process for Tinning Three Powder Cases, or $44\frac{3}{4}$ Superficial Feet of Copper Sheeting.*

	lbs.	oz.
Weight of copper before tinning	37	7
Ditto when drawn out of melted tin....	40	13
Ditto after wiping off.....	38	6
Ditto of tin scraped up.....	1	7
Ditto remaining on the copper	0	15
Ditto lost	1	0

TABLE II.—*Forty-five Superficial Feet of Copper Tinned by the New Method.*

	lbs.	oz.
Weight of copper before tinning	37	7
Ditto when drawn out	38	10
Ditto of tin remaining on the copper ..	1	3
Ditto, ditto wasted	none.	

Tables shewing the Articles required, and Expense of Tinning One Hundred Powder Cases under the Old and New Methods.

1ST.—OLD METHOD.

	£.	s.	d.
15 bushels of charcoal, at 1s. 0d.....	0	15	0
15 lbs. of sal ammoniac, at 10d.	0	12	6
Workmen's wages.—Five men employed for six days, at 3s. 4d. per day	5	0	0
Total	£6	7	6

2D. — NEW PROCESS.

	£.	s.	d.
12 lbs. of muriatic acid, at $1\frac{3}{4}d.$	0	1	9
Workmen's wages. — Five men employed for four days, at $3s. 4d.$ per day	3	6	8
Total	£3	8	5

Being but little more than half the cost of the old process.

I am, Sir, &c. &c.

W. A. GRAHAM, *Esq.*
Secretary, &c. &c.

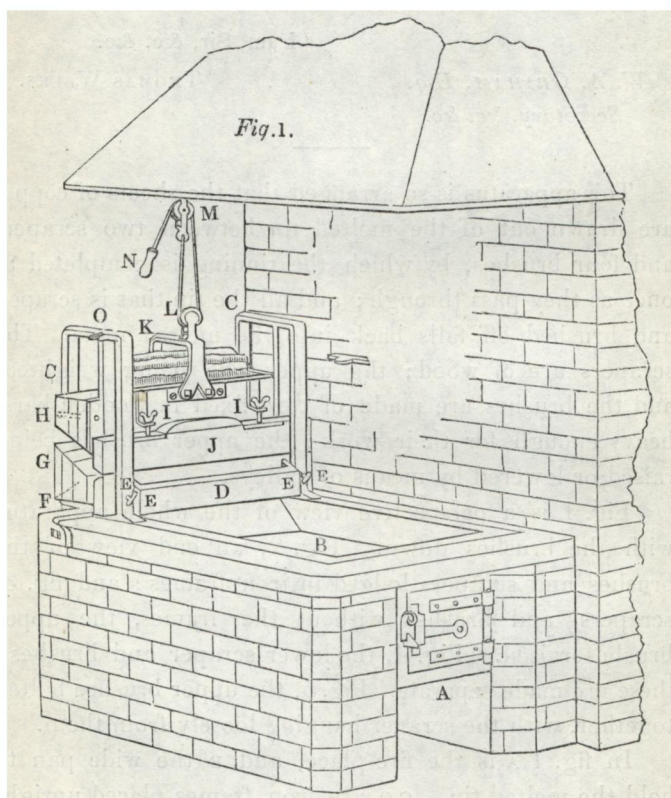
THOMAS WEEKS.

This apparatus is so arranged that the sheets of copper are drawn out of the melted tin between two scrapers and four brushes, by which the tinning is completed at once as they pass through; and all the tin that is scraped and brushed off falls back into the melted mass. The scrapers are of wood; the upper one being weighted, and the brushes are made of tow, fixed in wooden bars, heavy enough for their work; the upper brushes being raised or lowered by means of pulleys.

Fig. 1 is a perspective view of the whole apparatus with the brushes down. Fig. 2, an end view of the brushes and scrapers lodged in iron frames; and fig. 3, scrapers and brushes without the frames, the upper brushes raised. Fig. 4, the lower scraper and brushes; these are made separate. Fig. 5, the upper brushes bolted together, with the scraper hanging loosely from them.

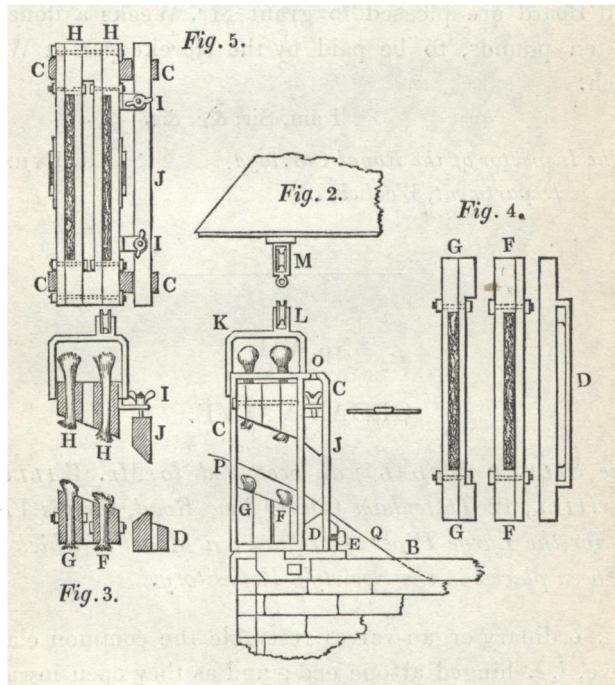
In fig. 1 A is the fire-place, and B the wide pan to hold the melted tin. C C are iron frames placed upright at one end of the pan; they each have a narrow and a wide opening; the brushes are placed in the wide space, and the scrapers in the narrow one. The lower scraper

D is double, and fixed in its place by two screws **E E**. **F** and **G**, the lower brushes lying in their place. **H H**, the upper brushes, from the front of which iron holes, **I I**, project; from these the upper scraper **J** hangs loosely by two screws and nuts, as shewn in figs. 3 and 5. The upper brushes **H** are only guided by the frames **C C**; they hang by the iron bow **K** and pulley **L** from the upper



pulley **M**. **N** is the handle by which the brushes are raised; it is then placed under the fork **O** to retain them, whilst the end **P**, fig. 2, of the copper is being laid on the

under brushes; the handle o is then disengaged to let the upper brushes fall on the copper, which is then to be pulled by its end r through the brushes from the pan of tin b, through which all the remainder of the copper passes, it being held down under the surface of the tin by a suitably shaped piece of wood. The upper scraper j, hanging loosely, and being weighted, accommodates itself to the copper independently of the brushes.



Mr. Weeks's apparatus has been adopted in the workshops of the arsenal at Woolwich; and the following copy of a letter from the Secretary of the Board of Ordnance was forwarded to the Society, by Mr. Weeks, as testimony of the approbation of the Board.

SIR,

Office of Ordnance, 6th May, 1840.

HAVING laid before the Master-General and Board a letter from the Assistant-Inspector of the Royal Carriage Department, dated the 29th ult., describing an improvement in the mode of tinning the copper linings of powder cases, suggested by Thomas Weeks, foreman in the department,

I am directed to acquaint you the Master-General and Board are pleased to grant Mr. Weeks a donation of ten pounds, to be paid by the storekeeper at Woolwich.

I am, Sir, &c. &c.

*The Inspector of the Royal Carriage
Department, Woolwich.*

R. BYHAM.

No. VII.

ORGAN-VALVE.

The SILVER MEDAL was presented to Mr. WILLIAM HILL, 12 Tottenham Court, New Road, for his Valve for the Large Pipes of Organs ; a Model of which has been placed in the Society's Repository.

THE ordinary organ-valves resemble the common clack-valve, *i. e.* hinged at one end ; and as they open inwards in the wind-chest, the direct resistance of the condensed air, to be overcome by the action of the key in opening the valve, is very considerable. In large organs the quantity of wind required for the supply of the pipes of the last octave is very great, and their valves being pro-